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Operating Instructions

Process pressure transmitter IPT-1* Vers. 3.0 - metalic sensor

4 … 20 mA

Document ID:
37300

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Supplementary documentation

Information:
Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "*Product description*".

Instructions manuals for accessories and replacement parts

Tip:
To ensure reliable setup and operation of your IPT-1*, we offer accessories and replacement parts. The corresponding documentations are:

- Operating instructions manual "*External indicating and adjustment unit*"

1 About this document

1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.
Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.
Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications
This symbol indicates special instructions for Ex applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

Mount and set up the pressure transmitter only if you know the applicable national regulations and have the appropriate qualification. You must be aquainted with the regulations and instructions for hazardous areas, measurement and control technology as well as electrical circuits because the pressure transmitter is "electrical equipment" according to EN 50178. Depending on the application conditions, it is necessary that you have appropriate knowledge, e.g. concerning corrosive products or high pressure.

2.2 Appropriate use

IPT-1* is a pressure transmitter for measurement of gauge pressure, absolute pressure and vacuum.

You can find detailed information on the application range in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

During the entire duration of use, the user is obliged to determine the compliance of the required occupational safety measures with the current valid rules and regulations and also take note of new regulations.

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2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

2.6 CE conformity

This device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, we provide confirmation of successful testing.

2.7 Fulfillment of NAMUR recommendations

The device fulfills the requirements of the applicable NAMUR recommendations.

2.8 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.9 Safety instructions for oxygen applications

For instruments in oxygen applications the special instructions in chapters "*Storage and transport*", "*Mounting*" as well as "*Technical data*" under "*Process conditions*"must be noted. Furthermore the valid national regulations, implementation instructions and memorandums of the BG (professional assoc.) must be noted.

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- IPT-1* process pressure transmitter
- Documentation
  - this operating instructions manual
  - Test certificate for pressure transmitters
  - Operating instructions manual "*Indicating and adjustment module*" (optional)
  - Supplementary instructions manual "*Plug connector for continuously measuring sensors*" (optional)
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - if necessary, further certificates

Supplementary label "Oil and grease-free for oxygen applications"

Instruments in the version "*Oil and grease-free for oxygen applications*" are equipped with a supplementary label. The supplementary label contains instructions on oil and grease-free parts of the instrument.

Constituents

The IPT-1* consist of the following components:

- Process fitting with measuring cell
- Housing with electronics, optionally available with plug connector
- Housing cover, optionally available with indicating and adjustment module

The components are available in different versions.

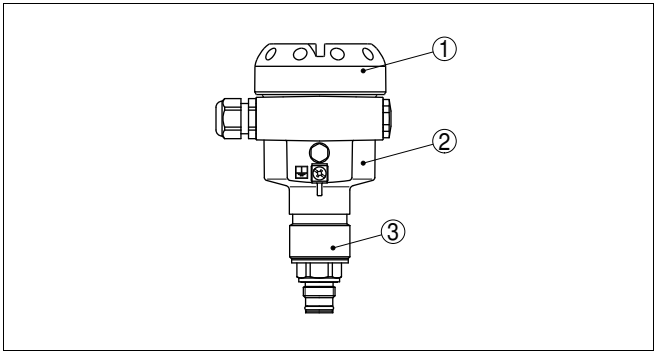


Fig. 1: Example of a IPT-1 with manometer connection G½ according to EN 837 and Alu housing*

1 Housing cover with integrated indicating and adjustment module (optional)
2 Housing with electronics
3 Process fitting with measuring cell

Type label

The type label contains the most important data for identification and use of the instrument:

- Instrument type
- Article and serial number device
- Technical data: Measuring range, process pressure, process temperature, signal output, voltage supply, protection, protection class
- Order number
- Article number, documentation
- SIL identification (with SIL rating ex works)

3.2 Principle of operation

Application area

IPT-1* is a pressure transmitter for measurement of overpressure, absolute pressure or vacuum. Measured products are gases, vapours and liquids in measuring ranges up to 4000 bar (400 MPa); with front-flush version also viscous liquids in measuring ranges up to 600 bar (60 MPa).

Functional principle

The process pressure acts on the sensor element via the stainless steel diaphragm. The process pressure causes a resistance change which is converted into a corresponding output signal and outputted as measured value.[1)]

Voltage supply

Two-wire electronics 4 … 20 mA for power supply and measured value transmission over the same cable.

The supply voltage range can differ depending on the instrument version. The exact range is stated in chapter "*Technical data*".

The background lighting of the indicating and adjustment module is powered by the sensor. A certain level of operating voltage is required for this. You can find the exact voltage specifications in chapter "*Technical data*".

3.3 Operation

IPT-1* can be adjusted with different adjustment media:

- with indicating and adjustment module
- the suitable WIKA DTM in conjunction with an adjustment software according to the FDT/DTM standard, e.g. PACTware and PC
- with manufacturer-specific adjustment programs AMS™ or PDM
- With a HART handheld

The entered parameters are generally saved in IPT-1*, optionally also in the indicating and adjustment module or in PACTware.

1) Measuring ranges up to 16 bar: piezoresistive sensor element with internal transmission liquid. Measuring ranges up to 25 bar: strain gauge (DMS) sensor element on the rear of the stainless steel diaphragm (dry).

3.4 Packaging, transport and storage

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test according to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Caution:
Instruments for oxygen applications are sealed in PE foil and provided with a label "Oxygen! Use no Oil". Remove this foil just before mounting the instrument! See instruction under "*Mounting*".

Transport

Transport must be carried out under consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

4 Mounting

4.1 General instructions

Suitability for the process conditions

Make sure that all parts of the instrument exposed to the process, in particular the sensor element, process seal and process fitting, are suitable for the existing process conditions. These include above all the process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" or on the type label.

Diaphragm protection

To protect the diaphragm, the process fitting is covered by a protective cap.

Remove the protective cap just before installation so that the diaphragm will not get damaged. It is recommended to keep the cap and use it again later for storage or transport.

Mounting position

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of an indicating and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the indicating and adjustment module in four different positions (each displaced by 90°).

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or on cooled or heated vessels.

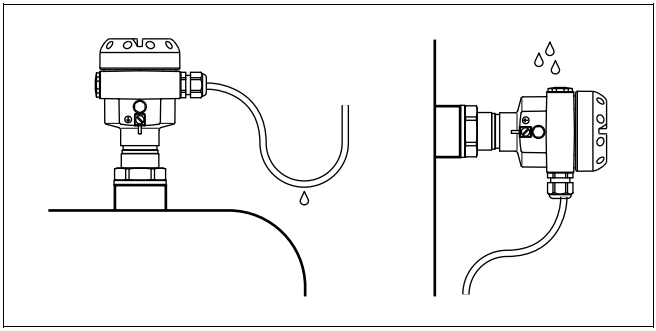


Fig. 2: Measures against moisture penetration

Ventilation

The ventilation for the electronics housing is realised via a filter element in the vicinity of the cable glands.

Fig. 3: Position of the filter element with single and double chamber housing

1 Filter element for ventilation of the electronics housing
2 Blind stopper

Information:
Make sure that the filter element is always free of buildup during operation. A high-pressure cleaner must not be used for cleaning.

Temperature limits

Higher process temperatures mean often also higher ambient temperatures.

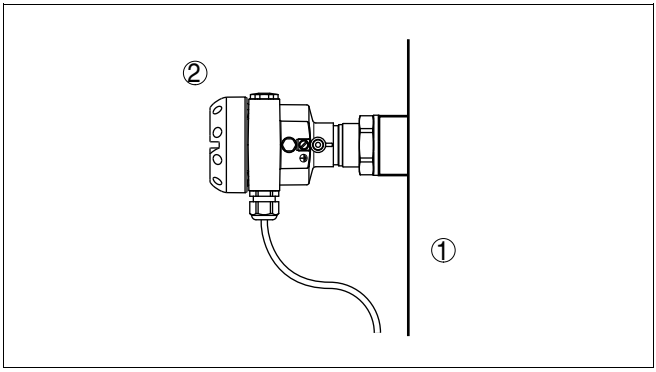


Fig. 4: Temperature ranges

1 Process temperature
2 Ambient temperature

Make sure that the upper temperature limits for the environment of electronics housing and connection cable specified in chapter "*Technical data*" are not exceeded.

Oxygen applications

Instruments in the version "*Oil and grease free for oxygen*" should be unpacked just before mounting. After the protective cover of the process fitting has been removed, the label "O_2" on the process fitting is visible.

Danger:
Avoid oil, grease or contamination. Explosion danger!

4.2 Mounting instructions

Mounting position

IPT-1* functions in any installation position. It is mounted according to the same directives as a manometer (DIN EN 839-2).[2)]

Information:
We recommend using lock fittings, measuring instrument holders and siphons from the line of WIKA accessories.

4.3 Mounting steps

Welding the socket

To mount IPT-1*, a welded socket is necessary. Use components from the line of WIKA mounting accessories.

→ Note the applicable welding standards (segment welding procedure) when welding the socket.

2) Probable position correction see chapter "Setup steps".

Sealing/Screwing in

Use the seal corresponding to the instrument:

- Process fitting GD: Tesnit seal in front of the thread

- or -

Seal the thread with teflon, hemp or a similar resistant seal material:

- Process fitting GN

→ Screw IPT-1* into the welded socket. Tighten the hexagon on the process fitting with a suitable wrench. Wrench size, see chapter "Dimensional drawings".

Warning:
The housing must not be used to screw the instrument in! Applying tightening force can damage internal parts of the housing.

Sealing/Screwing in hygienic fittings

Use the seal suitable for the respective process fitting. You can find the components in the supplementary instructions manual "*Welded socket and seals*".

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltage surges are expected, overvoltage arresters should be installed

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

Select power supply

Power supply and current signal are transmitted via the same two-wire connection cable. The supply voltage range can differ depending on the instrument version. The exact range is stated in the "*Technical data*" in the "*Supplement*".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN VDE 0106 part 101.

Keep in mind the following additional influences on the operating voltage:

- Output voltage of the power supply unit can be lower under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault message)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

Selecting connection cable

The instrument is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use cable with round cross-section. A cable outer diameter of 5 … 9 mm (0.2 … 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

Cable screening and grounding

If screened cable is necessary, connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the processing side must be made via a ceramic capacitor (e. g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection procedure

Proceed as follows:

1 Unscrew the housing cover

2 If an indicating and adjustment module is installed, remove it by turning it slightly to the left.

3 Loosen compression nut of the cable entry

4 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires

5 Insert the cable through the cable gland into the sensor

6 Lift the opening levers of the terminals with a screwdriver (see following illustration)

7 Insert the wire ends into the open terminals according to the wiring plan

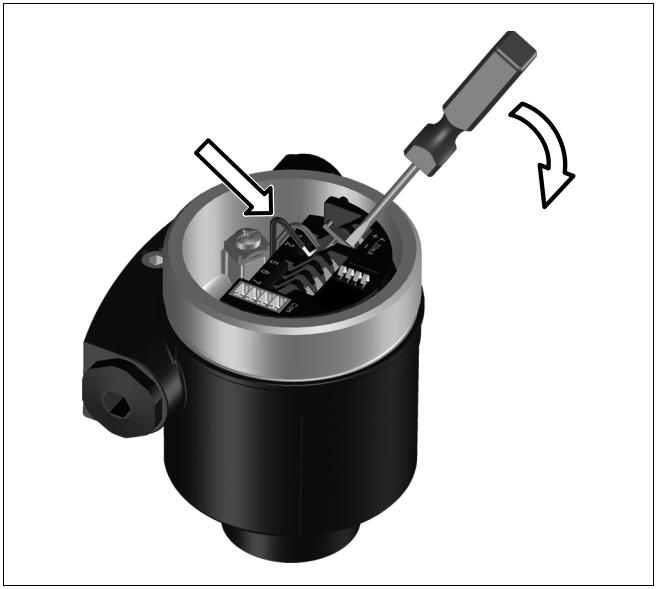


Fig. 5: Connection steps 6 and 7

8 Press down the opening levers of the terminals, you will hear the terminal spring closing

9 Check the hold of the wires in the terminals by lightly pulling on them

10 Connect the screen to the internal ground terminal, connect the outer ground terminal with potential equalisation

11 Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable

12 Screw the housing cover on

The electrical connection is finished.

5.3 Single chamber housing

Electronics and connection compartment

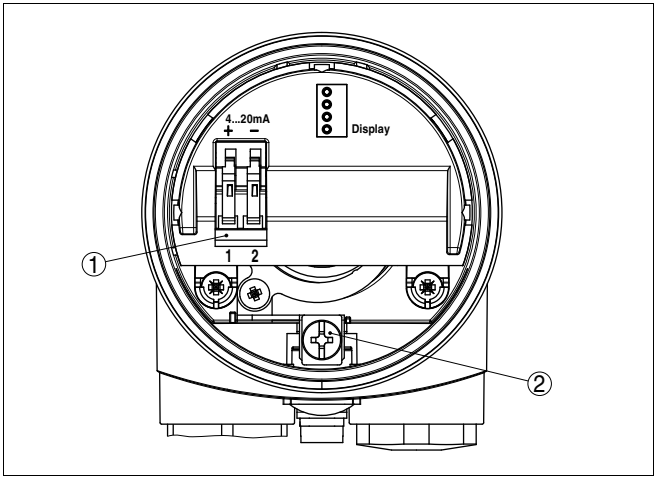


Fig. 6: Electronics and connection compartment with single chamber housing

1 Spring-loaded terminals for voltage supply
2 Ground terminal for connection of the cable screen

Wiring plan

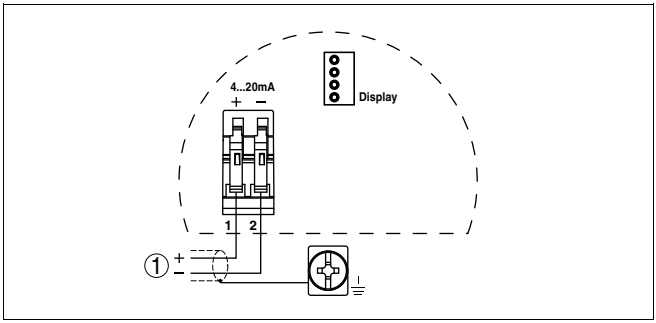


Fig. 7: Wiring plan, single chamber housing

1 Voltage supply/Signal output

5.4 Switch on phase

Switch on phase

After connecting IPT-1* to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the corresponding current is outputted to the cable (the value corresponds to the actual level as well as the settings already carried out, e.g. factory setting).

6 Set up with the indicating and adjustment module

6.1 Short description

Function/Configuration

The indicating and adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All sensors of the IPT-1* instrument family, in the single as well as double chamber housing (optionally in the electronics or connection compartment)
- External indicating and adjustment unit

Note:
You can find detailed information on adjustment in the operating instructions manual "*Indicating and adjustment module*".

6.2 Insert indicating and adjustment module

Mount/Dismount indicating and adjustment module

The indicating and adjustment module can be inserted and removed at any time. It is not necessary to interrupt the voltage supply.

For installation, proceed as follows:

1 Unscrew the housing cover
2 Place the indicating and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
3 Press the indicating and adjustment module onto the electronics and turn it to the right until it snaps in.
4 Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

The indicating and adjustment module is powered by the sensor, an additional connection is not necessary.

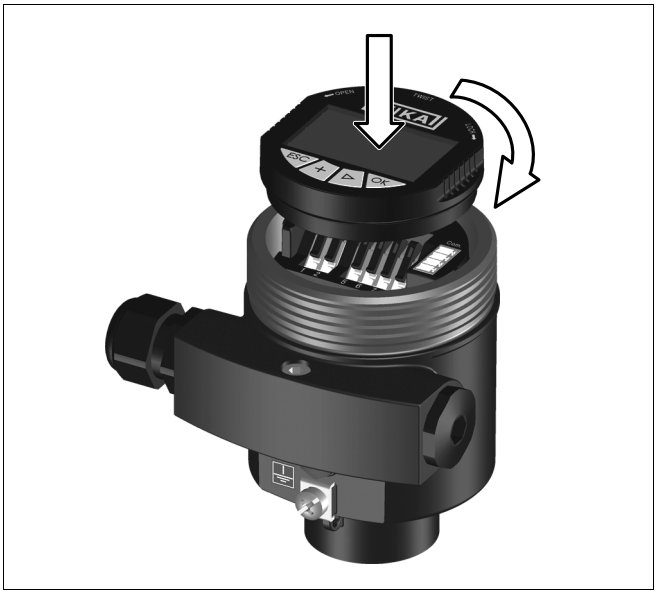


Fig. 8: Insert indicating and adjustment module

Note:
If you intend to retrofit the instrument with an indicating and adjustment module for continuous measured value indication, a higher cover with an inspection glass is required.

6.3 Adjustment system

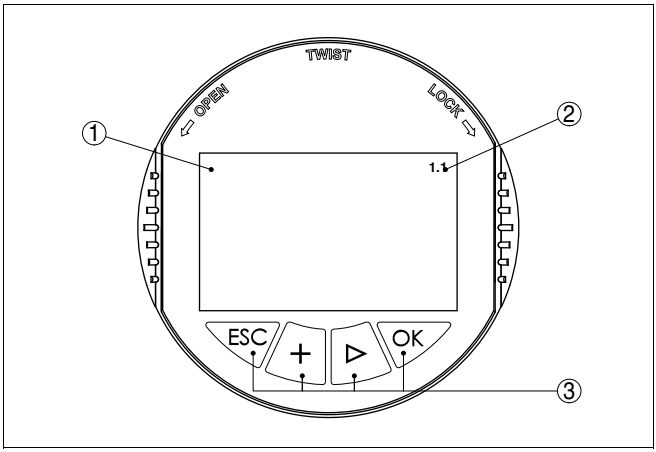


Fig. 9: Indicating and adjustment elements

1 LC display
2 Indication of the menu item number
3 Adjustment keys

Key functions

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key to select:
  - Menu change
  - Select list entry
  - Select editing position
- ***[+]*** key:
  - Change value of the parameter
- ***[ESC]*** key:
  - interrupt input
  - jump to the next higher menu

Adjustment system

The sensor is adjusted via the four keys of the indicating and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with ***[OK]*** will not be saved.

6.4 Setup procedure

Level or process pressure measurement

IPT-1* can be used for level as well as for process pressure measurement. Default setting is level measurement. The mode can be changed in the adjustment menu.

Depending on the application only the respective subchapter "Level or process pressure measurement" is of importance. There, you find the individual adjustment steps.

Level measurement

Parameter adjustment "Level measurement"

Set up IPT-1* in the following sequence:

1 Selecting adjustment unit/density unit
2 Carry out position correction
3 Carrying out min. adjustment
4 Carrying out max. adjustment

In the menu item "*Adjustment unit*" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi…

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

Information:
The steps 1, 3 and 4 are not necessary for instruments which are already preset according to customer specifications!

You can find the data on the type label on the instrument or in the menu items of the min./max. adjustment.

The indicating and adjustment module enables the adjustmetn without filling or pressure. Thanks to this, you can carry out your settings already in the factory without the instrument having to be installed.

The actual measured value is also displayed in the menu items for min./max. adjustment.

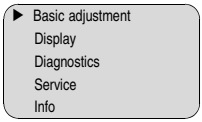
Select unit

In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

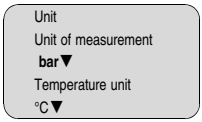
To select the adjustment unit (in the example switching over from bar to mbar), proceed as follows:[3)]

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.

[3)] Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH_2O, mmH_2O.



2 Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Unit*" will be displayed.



3 Activate the selection with ***[OK]*** and select "***Units of measurement*** with *[->]*.

4 Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (in the example mbar).

5 Confirm with ***[OK]*** and move to position correction with ***[->]***.

The adjustment unit is thus switched over from bar to mbar.

Information:
When switching over to adjustment in a height unit (in the example from bar to m), the density also has to be entered.

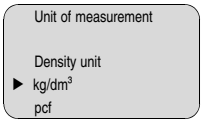
Proceed as follows:

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.

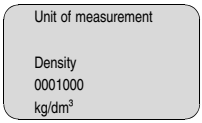
2 Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Units of measurement*" will be displayed.

3 Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (in the example m).

4 Confirm with ***[OK]***, the submenu "*Density unit*" appears.



5 Select the requested unit, e.g. kg/dm³ with ***[->]*** and confirm with ***[OK]***, the submenu "*Density*" appears.



6 Enter the requested density value with ***[->]*** and ***[+]***, confirm with ***[OK]*** and move to position correction with ***[->]***.

The adjustment unit is thus switched over from bar to m.

Proceed as follows to select the temperature unit:[4)]

→ Activate the selection with ***[OK]*** and select "***Temperature unit*** with *[->]*.

→ Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (e.g. °F).

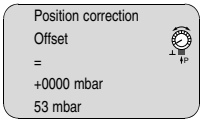
→ Confirm with ***[OK]***.

The temperature unit is hence switched over from °C to °F.

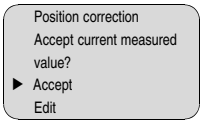
Carry out position correction

Proceed as follows:

1 Activate in the menu item "*Position correction*" the selection with ***[OK]***.



2 Select with ***[->]***, e.g. to accept actual measured value.

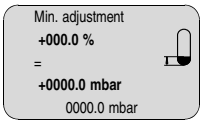


3 Confirm with ***[OK]*** and move to min.(zero) adjustment with ***[->]***.

Carrying out min. adjustment

Proceed as follows:

1 Edit the % value in the menu item "*Min. adjustment*" with ***[OK]***.



2 Set the requested percentage value with ***[+]*** and ***[->]***.

3 Edit the requested mbar value with ***[OK]***.

4 Set the requested mbar value with ***[+]*** and ***[->]***.

5 Confirm with ***[+]*** and move to max. adjustment with ***[->]***.

The min. adjustment is finished.

Information:
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

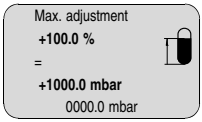
[4)] Selection options: °C, °F.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Carrying out max. adjustment

Proceed as follows:

1 Edit the % value in the menu item "*Max. adjustment*" with ***[OK]***.



Information:
The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1 bar = 1000 mbar).

2 Set the requested percentage value with ***[->]*** and ***[OK]***.

3 Edit the requested mbar value with ***[OK]***.

4 Set the requested mbar value with ***[+]*** and ***[->]***.

5 Confirm with ***[OK]*** and move to the menu overview with ***[ESC]***.

The max. adjustment is finished.

Information:
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Process pressure measurement

Parameter adjustment "Process pressure measurement"

Set up IPT-1* in the following sequence:

1 Select application "Process pressure measurement"

2 Select the unit of measurement

3 Carry out position correction

4 Carrying out zero adjustment

5 Carrying out span adjustment

In the menu item "*Adjustment unit*" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi…

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

In the menu items "*zero*" and "*span*" you determine the span of the sensor, the span corresponds to the end value.

Information:
The steps 1, 3 and 4 are not necessary for instruments which are already preset according to customer specifications!

You can find the data on the type label on the instrument or in the menu items of the zero/span adjustment.

The indicating and adjustment module enables the adjustmetn without filling or pressure. Thanks to this, you can carry out your settings already in the factory without the instrument having to be installed.

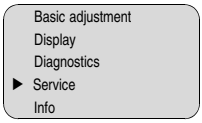
The actual measured value is displayed in addition to the menu items for zero/span adjustment.

Select application "Process pressure measurement"

IPT-1* is preset to application "Level measurement". Proceed as follows when switching over to application "Process pressure measurement":

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.

2 Select the menu "***Service***" with *[->]* and confirm with ***[OK]***.



3 Select the menu item "***Application***" with *[->]* and edit with ***[OK]***.

Warning:
Note the warning: "*Output can change*".

4 Select with ***[->]*** "*OK*" and confirm with ***[OK]***.

5 Select "*Process pressure*" from the list and confirm with ***[OK]***.

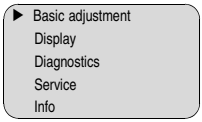
Select unit

In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

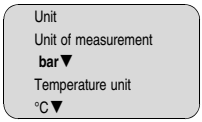
To select the adjustment unit (in the example switching over from bar to mbar), proceed as follows:[5)]

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.

[5)] Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH_2O, mmH_2O.



2 Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Unit*" will be displayed.



3 Activate the selection with ***[OK]*** and select "***Units of measurement*** with *[->]*.

4 Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (in the example mbar).

5 Confirm with ***[OK]*** and move to position correction with ***[->]***.

The adjustment unit is thus switched over from bar to mbar.

Proceed as follows to select the temperature unit:[6)]

→ Activate the selection with ***[OK]*** and select "***Temperature unit*** with *[->]*.

→ Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (e.g. °F).

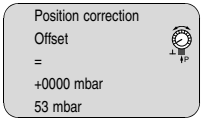
→ Confirm with ***[OK]***.

The temperature unit is hence switched over from °C to °F.

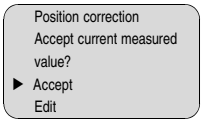
Carry out position correction

Proceed as follows:

1 Activate in the menu item "*Position correction*" the selection with ***[OK]***.



2 Select with ***[->]***, e.g. to accept actual measured value.



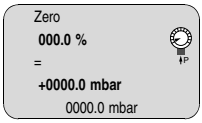
3 Confirm with ***[OK]*** and move to min.(zero) adjustment with ***[->]***.

6) Selection options: °C, °F.

Carrying out zero adjustment

Proceed as follows:

1 Edit the mbar value in the menu item "*zero*" with ***[OK]***.



2 Set the requested mbar value with ***[+]*** and ***[->]***.

3 Confirm with ***[+]*** and move to span adjustment with ***[->]***.

The zero adjustment is finished.

Information:
The zero adjustment shifts the value of the span adjustment. The span, i.e. the difference between these values, however, remains unchanged.

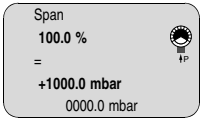
Information:
For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Carrying out span adjustment

Proceed as follows:

1 Edit the mbar value in the menu item "*span*" with ***[OK]***.



Information:
The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1 bar = 1000 mbar).

2 Set the requested mbar value with ***[->]*** and ***[OK]***.

3 Confirm with ***[OK]*** and move to the menu overview with ***[ESC]***.

The span adjustment is finished.

Information:
For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Copy sensor data

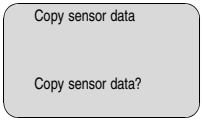
This function enables reading out parameter adjustment data as well as writing parameter adjustment data into the sensor via the indicating and adjustment module. A description of the function is available in the operating instructions manual "*Indicating and adjustment module*".

The following data are read out or written with this function:

- Measured value presentation
- Adjustment
- Damping
- Linearisation curve
- Sensor-TAG
- Displayed value
- Display unit
- Scaling
- Current output
- Unit of measurement
- Language

The following safety-relevant data are **not** read out or written:

- SIL
- HART mode
- PIN
- Application



Reset

Basic adjustment

If the "*Reset*" (sensor-specific basic adjustment) is carried out, the sensor resets the values of the following menu items to the reset values (see chart):

Menu section	Function	Reset value
Basic settings	Unit of measurement	bar
	Temperature unit	°C
	Zero/Min. adjustment	Measuring range begin
	Span/Max. adjustment	Measuring range end
	Density	1 kg/l
	Density unit	kg/l
	Damping	1 s
	Linearisation	linear

Menu section	Function	Reset value
	Sensor-TAG	Sensor
Display	Displayed value 1	bar
	Displayed value 2	%
	Display unit	Volume/l
	Scaling	0.00 to 100.0
	Decimal point indication	8888.8
Service	Current output - characteristics	4 … 20 mA
	Current output - failure	< 3.6 mA
	Current output - min. current	3.8 mA
	Current output - max. current	20.5 mA

The values of the following menu items are *not* reset with "**Reset**:

Menu section	Function	Reset value
Basic settings	Position correction	no reset
Display	Lighting	no reset
Service	SIL	no reset
	Language	no reset
	HART mode	no reset
	Application	no reset

Factory setting
Like basic adjustment, in addition, special parameters are reset to default values.[7)]

Pointer
The min. and max. temperature or pressure values are each reset to the actual value.

Optional settings

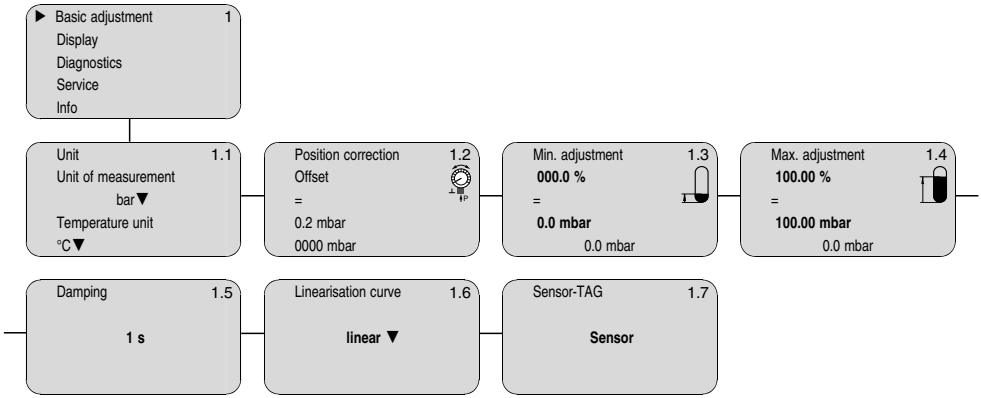
Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual "*Indicating and adjustment module*".

7) Special parameters are parameters which are set customer-specifically on the service level with the adjustment software PACTware.

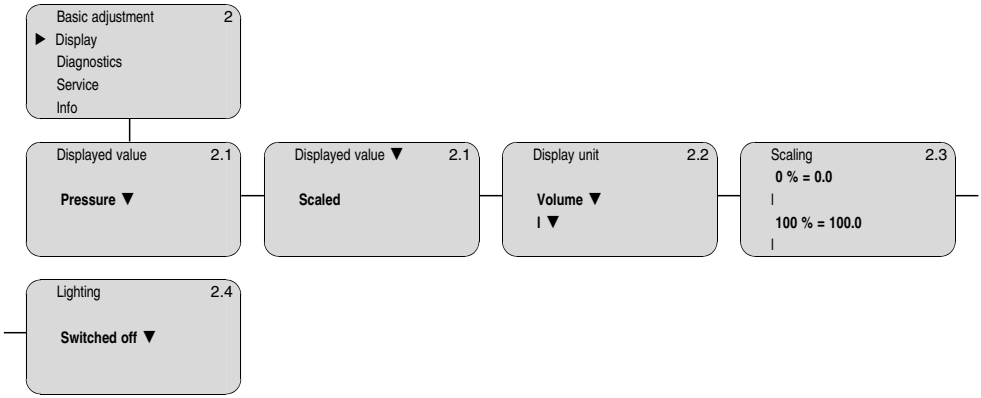
6.5 Menu schematic

Information:
Depending on the version and application, the highlighted menu windows may not always be available.

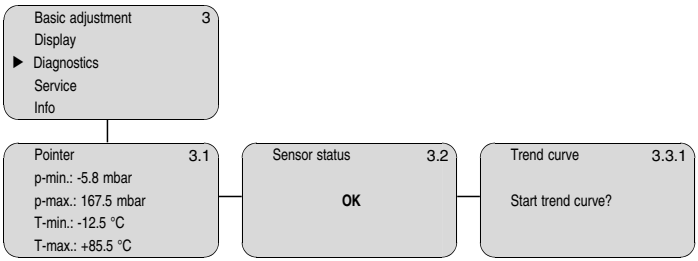
Basic adjustment



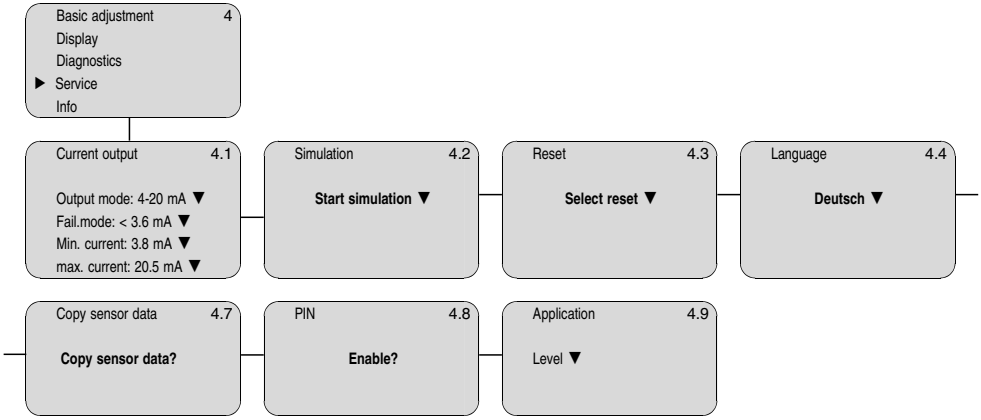
Display



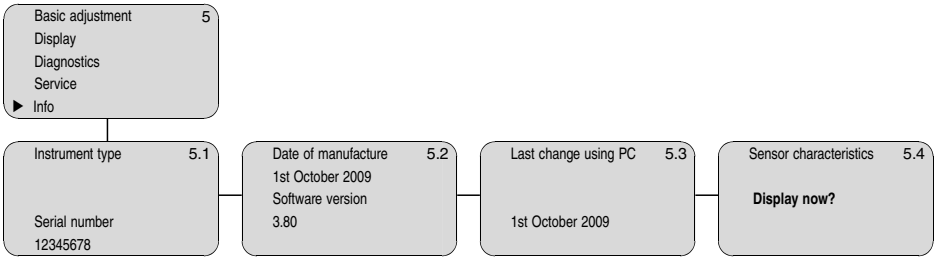
Diagnostics



Service



Info



6.6 Saving the parameter adjustment data

It is recommended noting the adjusted data, e.g. in this operating instructions manual and archive them afterwards. They are hence available for multiple use or service purposes.

If IPT-1* is equipped with an indicating and adjustment module, the most important data can be read out of the sensor into indicating and adjustment module. The procedure is described in the operating instructions manual "*Indicating and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange the sensor, the indicating and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".

7 Maintenance and fault rectification

7.1 Maintenance, cleaning

When the instrument is used properly, no special maintenance is required in normal operation.

In some applications, product buildup on the sensor diaphragm can influence the measuring result. Depending on the sensor and application, take precautions to ensure that heavy buildup, and especially a hardening thereof, is avoided.

If necessary, the transmitter has to be cleaned. In this case, make sure that the materials are resistant against the cleaning detergents.

7.2 Rectify malfunctions

Reaction when malfunctions occur

The operator of the system is responsible for taking suitable measures to remove interferences.

Causes of malfunction

IPT-1* offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the indicating and adjustment module. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with the software PACTware and the suitable DTM. In many cases, the causes can be determined this way and faults rectified.

Checking the 4 … 20 mA signal

Connect a handheld multimeter in the suitable measuring range according to the wiring plan.

? 4 … 20 mA signal not stable

- Level fluctuations

→ Set the integration time via the indicating and adjustment module or PACTware

- no atmospheric pressure compensation

→ Check the pressure compensation in the housing and clean the filter element, if necessary

? 4 … 20 mA signal missing

- Connection to voltage supply wrong

→ Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"

- No power supply

→ Check cables for breaks; repair if necessary

- Operating voltage too low or load resistance too high

→ Check, adapt if necessary

? Current signal greater than 22 mA or less than 3.6 mA

- electronics module or measuring cell defective

→ Exchange the instrument or send it for repair

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Fault messages via the indicating/adjustment module

? E013

- no measured value available[8)]

→ Exchange the instrument or send it for repair

? E017

- Adjustment span too small

→ repeat with modified values

? E036

- no operable sensor software

→ Carry out a software update or send instrument for repair

? E041

- Hardware error

→ Exchange the instrument or send it for repair

Reaction after fault rectification

Depending on the failure reason and measures taken, the steps described in chapter "*Set up*" must be carried out again, if necessary.

7.3 Instrument repair

You can download a return form (24 KB) in the Internet from our homepage www.wika.com under the item "*Service*".

If a repair is necessary, please proceed as follows:

- Print and fill out one form per instrument

[8)] Fault message can also appear if the pressure is higher than the nominal range.

- If necessary, state a contamination
- Clean the instrument and pack it damage-proof
- Attach the completed form and probably a safety data sheet to the instrument
- Please contact the agency serving you for the address of the return shipment

By doing this you help us carry out the repair quickly and without having to call back for needed information.

8 Dismounting

8.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

8.2 Removal

Note:
When disposing of old instruments, take note of the valid legal and municipal regulations. The appropriate parts must be recycled.

9 Supplement

9.1 Technical data

General data	
Pressure type	Gauge pressure or gauge pressure
Measuring principle	
– Measuring ranges ≤ 16 bar	piezoresistive with internal transmission liquid
– Measuring ranges > 16 bar	Strain gauge (DMS) dry
Service interface	I^2C-Bus

Materials and weights	
316L corresponds to 1.4404 or 1.4435, 316Ti corresponds to 1.4571	
Materials, wetted parts	
– Process fitting	316Ti, Hastelloy C4
– Diaphragm	316Ti, Hastelloy C4
– Diaphragm from measuring range 25 bar, with not flush version	Elgiloy 2.4711
– Seal ring, O-ring	FKM, EPDM, NBR
Materials, non-wetted parts	
– Internal transmission liquid	Synthetic oil, Halocarbon oil[9)10)]
– Housing	Plastic PBT, Alu die-casting powder-coated, 316L
– Seal between housing and housing cover	NBR (stainless steel housing), silicone (Aluminium housing)
– Inspection window in housing cover for indicating and adjustment module	Polycarbonate (UL-746-C listed)
– Ground terminal	316Ti/316L
Weight approx.	1.2 kg (2.646 lbs)

Output variable	
Output signal	4 … 20 mA
Signal resolution	1.6 µA
Failure signal output current	mA-value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable)
Max. output current	22 mA
Load	see load diagram under Power supply
Fulfilled NAMUR recommendations	NE 43

9) Synthetic oil for measuring ranges up to 16 bar, FDA listed for the food processing industry. For measuring ranges up to 25 bar dry measuring cell.

10) Halocarbon oil: Generally in oxygen applications, not with vacuum measuring ranges, not with absolute measuring ranges < 1 bar_{abs}.

Dynamic behaviour output

Run-up time approx.	10 s

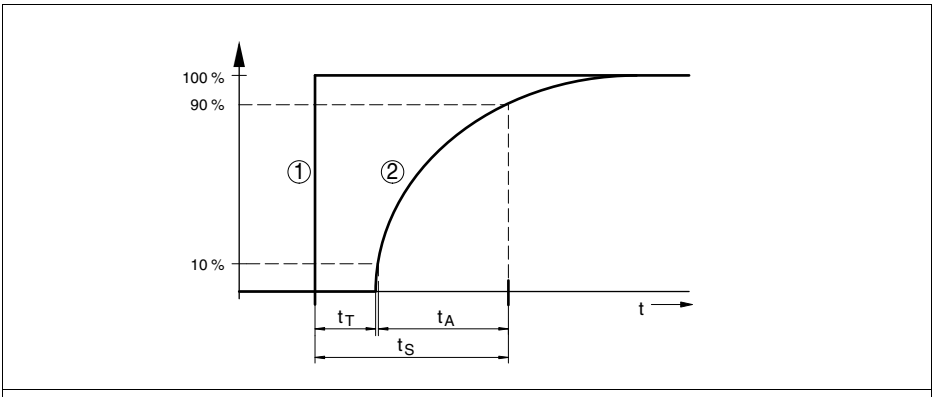


Fig. 10: Sudden change of the process variable. t_T: dead time; t_A: rise time; t_S: jump response time

1 Process variable
2 Output signal

Dead time	≤ 150 ms
Rise time	≤ 100 ms (10 … 90 %)
Step response time	≤ 250 ms (ti: 0 s, 10 … 90 %)
Damping (63 % of the input variable)	0 … 999 s, adjustable

Input variable

Adjustment

Adjustment range of the min./max. adjustment relating to the nominal measuring range:

– Min.	-5 … +95 %
– Max.	-5 … +105 %

Adjustment range of the zero/span adjustment relating to the nominal measuring range:

– zero	-5 … +95 %
– Span	-5 … +105 %

Recommended max. turn down	10 : 1 (no limitation)

Nominal measuring ranges and overload resistance

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 … 0.4 bar/0 … 40 kPa	2 bar/200 kPa	-1 bar/-100 kPa
0 … 1.6 bar/0 … 160 kPa	10 bar/1000 kPa	-1 bar/-100 kPa
0 … 16 bar/0 … 1.6 MPa	80 bar/8 MPa	-1 bar/-100 kPa
0 … 40 bar/0 … 4 MPa	80 bar/8 MPa	-1 bar/-100 kPa

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
0 … 100 bar/0 … 10 MPa	200 bar/20 MPa	-1 bar/-100 kPa
0 … 250 bar/0 … 25 MPa	500 bar/50 MPa	-1 bar/-100 kPa
0 … 600 bar/0 … 60 MPa	1200 bar/120 MPa	-1 bar/-100 kPa
-1 … 3 bar/-100 … 300 kPa	17 bar/1700 kPa	-1 bar/-100 kPa
-1 … 5 bar/-100 … 500 kPa	35 bar/3500 kPa	-1 bar/-100 kPa
-1 … 15 bar/-100 … 1.5 MPa	80 bar/8 MPa	-1 bar/-100 kPa
Absolute pressure		
0 … 0.4 bar/0 … 40 kPa	2 bar/200 kPa	0 bar abs.
0 … 1.6 bar/0 … 160 kPa	10 bar/1000 kPa	0 bar abs.
0 … 6 bar/0 … 600 kPa	35 bar/3500 kPa	0 bar abs.
0 … 16 bar/0 … 1.6 MPa	80 bar/8 MPa	0 bar abs.

Reference conditions and actuating variables (similar to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1

- Temperature +18 … +30 °C (+64 … +86 °F)
- Relative humidity 45 … 75 %
- Air pressure 860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psig)

Determination of characteristics: Limit point adjustment according to IEC 61298-2

Characteristics: linear

Reference installation position: upright, diaphragm points downward

Influence of the installation position: depending on the isolating diaphragm version

Deviation determined according to the limit point method according to IEC 60770[11)]

Applies to **digital** interfaces (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 … 20 mA. Specifications refer to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

Deviation for measuring ranges 0.4 … 1000 bar

- Turn down 1 : 1 up to 5 : 1 < 0.1 %
- Turn down > 5 : 1 < 0.02 % x TD

Deviation for measuring ranges > 1000 bar

- Turn down 1 : 1 up to 2 : 1 < 0.6 %

Deviation with absolute pressure measuring range 0.1 bar

- Turn down 1 : 1 up to 5 : 1 < 0.25 %
- Turn down > 5 : 1 < 0.05 % x TD

[11)] Incl. non-linearity, hysteresis and non-repeatability.

Influence of the product or ambient temperature

Thermal change zero signal and output span

Applies to the **digital** signal output (HART, Profibus PA, Foundation Fieldbus) as well as to the **analogue** current output 4 … 20 mA and refers to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

Thermal change zero signal and output span, reference temperature 20 °C (68 °F):

– In the compensated temperature range 0 … +100 °C (+32 … +212 °F)	< 0.05 %/10 K x TD
– Outside the compensated temperature range	typ. < 0.05 %/10 K x TD

Thermal change, current output

Applies also to the **analogue** 4 … 20 mA current output and refers to the set span.

Thermal change, current output	< 0.15 % at -40 … +80 °C (-40 … +176 °F)

Long-term stability (similar to DIN 16086, DINV 19259-1 and IEC 60770-1)

Applies to **digital** interfaces (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 … 20 mA. Specifications refer to the set span. Turn down (TD) = nominal measuring range/set span.

Long-term drift of the zero signal	< (0.1 % x TD)/year

Ambient conditions

Ambient, storage and transport temperature

– Standard version	-40 … +80 °C (-40 … +176 °F)
– Standard version with indicating and adjustment module	-15 … +70 °C (+5 … +158 °F)
– Connection G1 A front-flush according to EHEDG	-10 … +80 °C (+14 … +176 °F)
– Fitting G1 A front-flush according to EHEDG with indicating and adjustment module	-10 … +70 °C (+14 … +158 °F)
– Version for oxygen applications[12)]	-40 … +60 °C (-40 … +140 °F)
– Version for oxygen applications with indicating and adjustment module[13)]	-15 … +60 °C (+5 … +140 °F)

Process conditions

The specifications are used as an overview. For pressure stage and product temperature the specifications on the type plate are applicable.

Product temperature standard, depending on the seal[14)]

– FKM (VP2/A)	-20 … +105 °C (-4 … +221 °F)

12) Up to 60 °C (140 °F).
13) Up to 60 °C (140 °F).
14) Version for oxygen applications up to 60 °C (140 °F).

– EPDM (A+P 75.5/KW75F)	-40 … +105 °C (-40 … +221 °F)
– NBR (COG)	-20 … +105 °C (-4 … +221 °F)

Product temperature front-flush threaded fitting G1 A according to EHEDG, threaded fitting M44 x 1.25 as well as hygienic fittings, depending on seal[15] [16]

– FKM (VP2/A)	-20 … +150 °C (-4 … +302 °F)
– EPDM (A+P 75.5/KW75F)	-30 … +150 °C (-22 … +302 °F)
– NBR (COG)	-20 … +150 °C (-4 … +302 °F)
Vibration resistance	mechanical vibrations with 4 g and 5 … 100 Hz[17]
Shock resistance	Acceleration 100 g/6 ms[18]

Electromechanical data - version IP 66/IP 67

Cable entry/plug[19]

– Single chamber housing
- 1 x cable gland M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind stopper M20 x 1.5

or:
- 1 x closing cap ½ NPT, 1 x blind plug ½ NPT

or:
- 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5

– Double chamber housing
- 1 x cable entry M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind stopper M20 x 1.5; plug M12 x 1 for the external indicating and adjustment unit (optional)

or:
- 1 x closing cap ½ NPT, 1 x blind stopper ½ NPT, plug M12 x 1 for the external indicating and adjustment unit (optional)

or:
- 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5; plug M12 x 1 for the external indicating and adjustment unit (optional)

Spring-loaded terminals for wire cross-section up to	2.5 mm² (AWG 14)

Indicating and adjustment module

Voltage supply and data transmission	through the sensor
Indication	LC display in dot matrix

15) Not with hygienic fitting with compression nut F40 PN40/316L
16) Version for oxygen applications up to 60 °C (140 °F).
17) Tested according to the regulations of German Lloyd, GL directive 2.
18) Tested according to EN 60068-2-27.
19) Depending on the version M12 x 1, according to DIN 43650, Harting, 7/8" FF.

Adjustment elements	4 keys
Protection rating	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Materials	
– Housing	ABS
– Inspection window	Polyester foil

Voltage supply

Operating voltage	
– Non-Ex instrument	12 … 36 V DC
– EEx-ia instrument	12 … 30 V DC
– Exd instrument	18 … 36 V DC
Operating voltage with lighted indicating and adjustment module	
– Non-Ex instrument	20 … 36 V DC
– EEx-ia instrument	20 … 30 V DC
– EEx-d-ia instrument	20 … 36 V DC
Permissible residual ripple	
– < 100 Hz	U_{ss} < 1 V
– 100 Hz … 10 kHz	U_{ss} < 10 mV
Load	see diagram

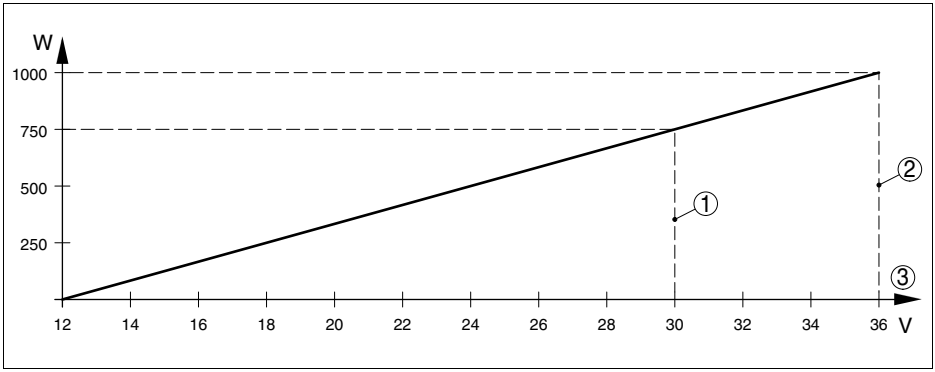


Fig. 11: Voltage diagram

1 Voltage limit EEx-ia instrument
2 Voltage limit non-Ex/Exd instrument
3 Operating voltage

Electrical protective measures

Protection rating	
– Housing, standard	IP 66/IP 67[20)]
Overvoltage category	III
Protection class	II

Approvals

Depending on the version, instruments with approvals can have different technical data. For these instruments, please note the corresponding approval documents. They are included in the scope of delivery.

[20)] Instruments with gauge pressure measuring ranges cannot detect the ambient pressure when submerged, e.g. in water. This can lead to falsification of the measured value.

9.2 Dimensions

Housing

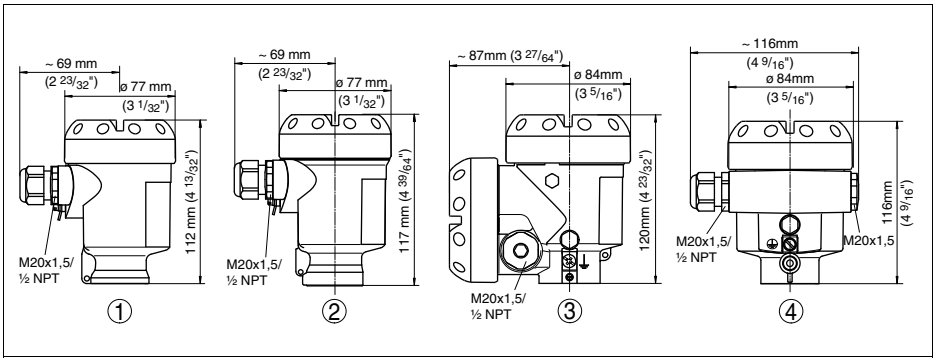


Fig. 12: Housing versions (with integrated indicating and adjustment module the housing is 9 mm/0.35 in higher)

1 Plastic housing
2 Stainless steel housing
3 Aluminium double chamber housing
4 Aluminium housing

IPT-1* - threaded fitting

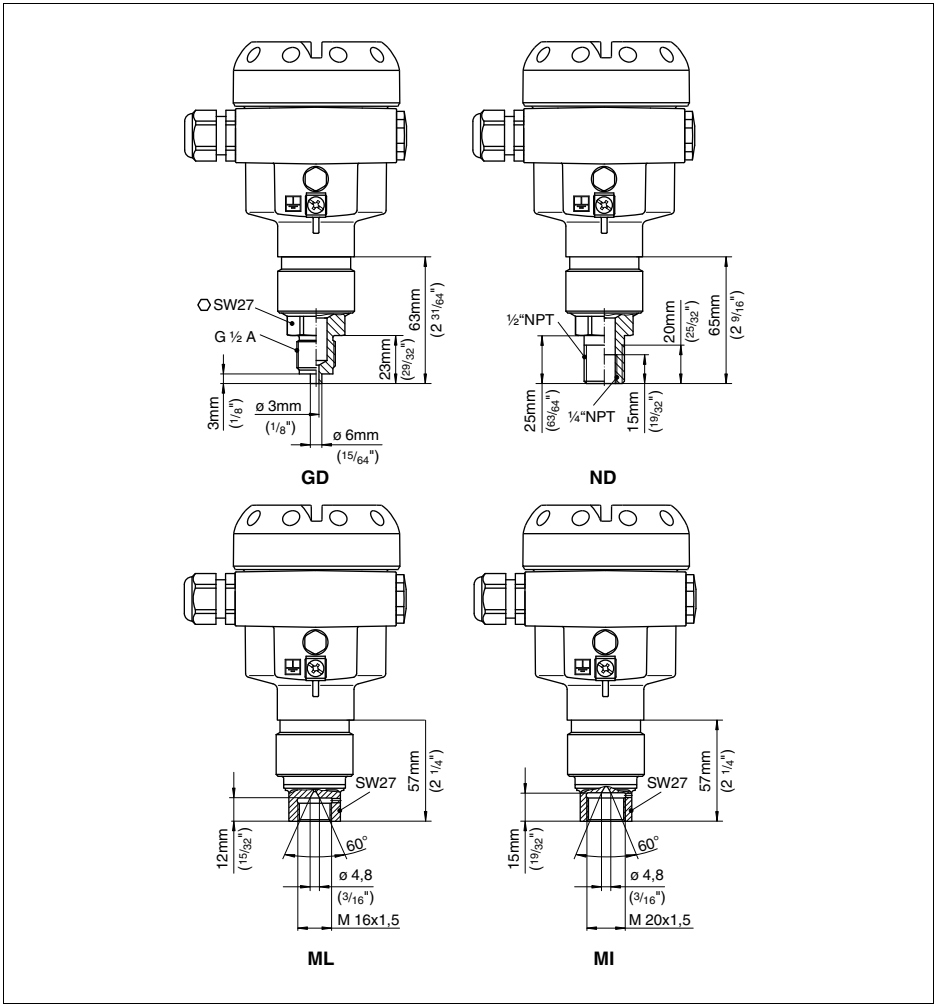


Fig. 13: IPT-1 GD = G½ EN 837, ND = ½ NPT, ML = M16 x 1.5 inner, MI = M20 x 1.5 inner*

IPT-1* - front-flush connection, part 1

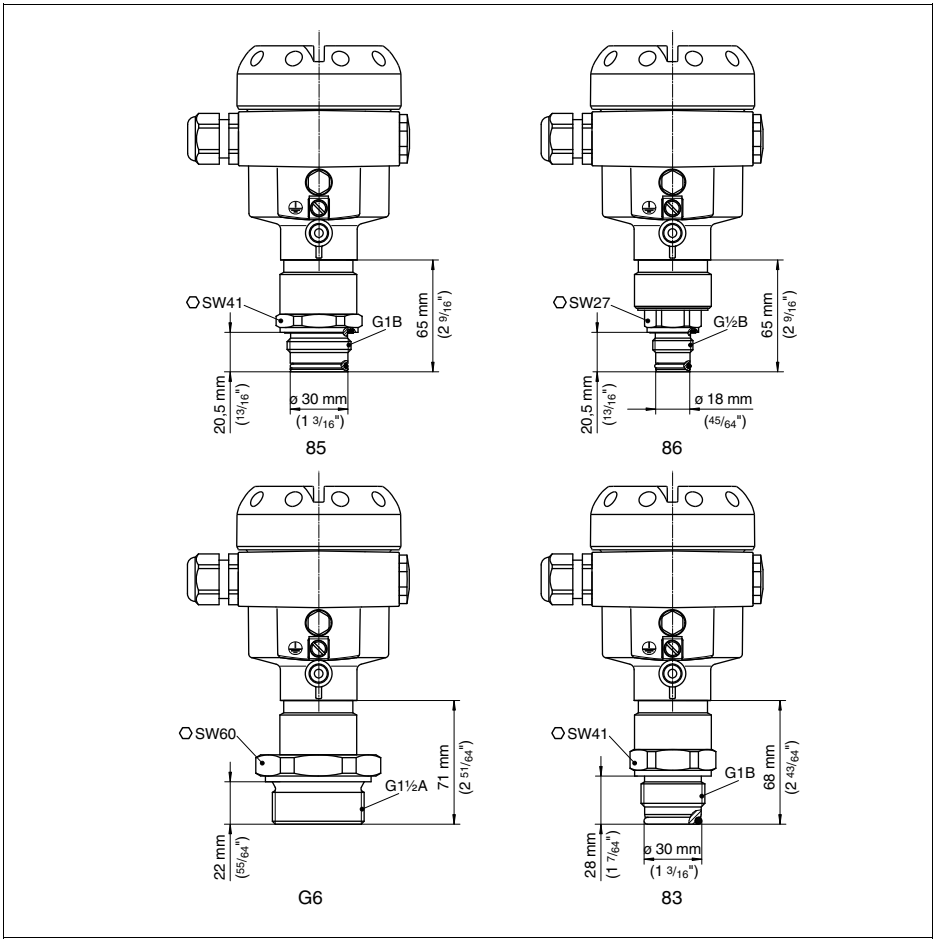


Fig. 14: IPT-1 85 = G1 A front-flush 0 … 0.4 bar and 0 … 1.6 bar, 86 = G½ A front-flush > 1.6 bar, 84 = G1 A front-flush up to 150 °C according to EHEDG 0 … 0.4 bar and 0 … 16 bar*

IPT-1* - front-flush connection, part 2

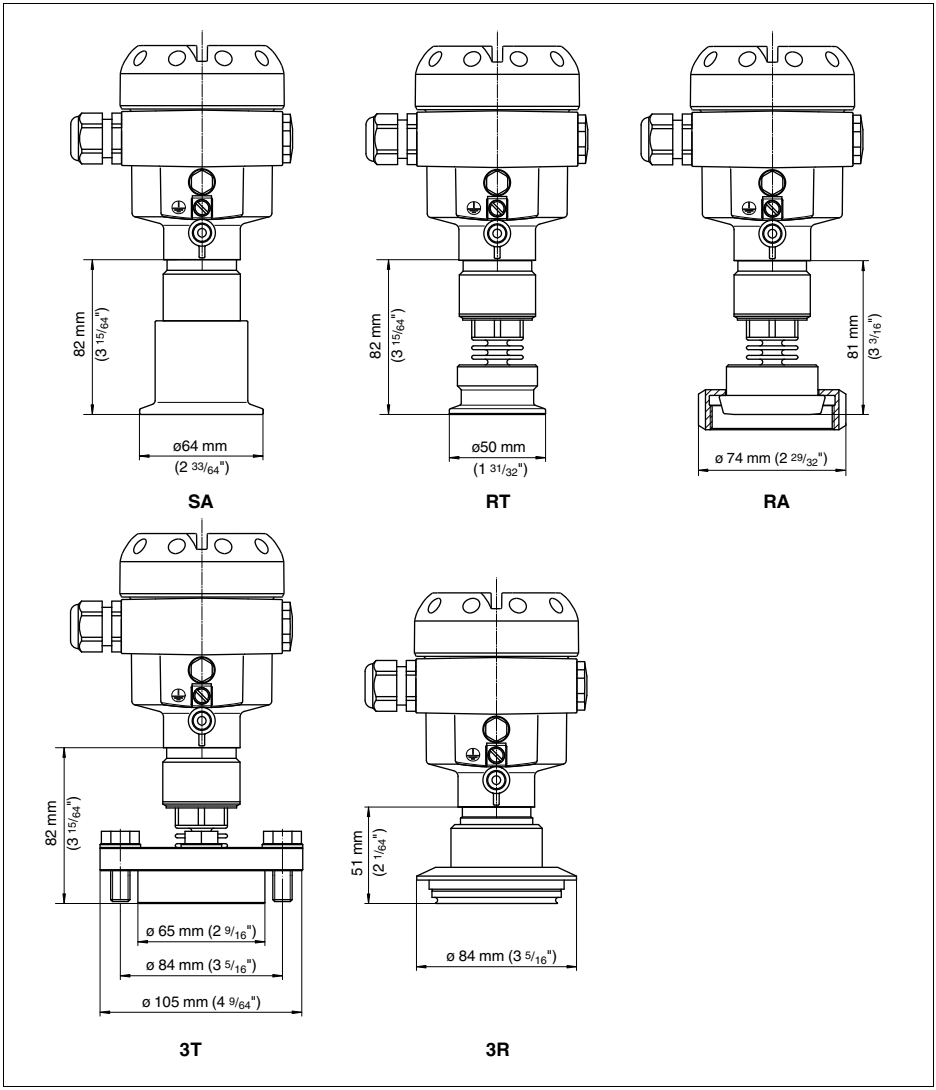


Fig. 15: IPT-1 - SA = Tri-Clamp 2", RA = bolting DN 40/PN 40 according to DIN 11851, RT = Tri-Clamp 1½", 3T = DRD, 3R = Varivent Form F*

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All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.